Information
and Privacy
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Geographic Information Systems

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INTRODUCTION

Profound technological advances are transforming the basic nature of information management. As governments implement new information technology, conventional paper records are fast giving way to powerful electronic databases. One type of information management system increasingly being introduced by government organizations is Geographic Information System (GIS) technology.

GIS technology has been developing steadily since the 1960s. Government organizations in Canada have played a pivotal role in that development. Initially, applications were confined to organizing and analyzing information about natural resources. As the technology has matured, become more user-friendly, and costs have decreased, GIS applications have spread. In Ontario, a number of provincial and municipal government organizations currently utilize GIS technology.

The purposes of the *Freedom of Information and Protection of Privacy Act* and the *Municipal Freedom of Information and Protection of Privacy Act* (the *Acts*) are:

- to provide a right of access to information under the control of institutions in accordance with the principles that,
  - information should be available to the public,
  - necessary exemptions from the right of access should be limited and specific, and
  - decisions on the disclosure of government information should be reviewed independently of government;[1] and

- to protect the privacy of individuals with respect to personal information about themselves held by institutions and to provide individuals with a right of access to that information.

As government organizations move with increasing speed toward the creation of a predominantly electronic environment, it is not always clear how to facilitate these purposes and rights. New questions and concerns inevitably arise about the protection of privacy, the nature of public access to information under the control of government organizations (government information), and the applicability of Ontario's freedom of information and protection of privacy legislation. The access and privacy issues associated with today's electronic environment, of which GIS technology is a part, are complex and challenging.

The Office of the Information and Privacy Commissioner/Ontario (the IPC) has a mandate under the *Acts* to offer comment on the privacy protection implications of government programs, to research matters affecting the purposes of the *Acts*, and to conduct public education. In the fulfilment of that mandate, the IPC has examined GIS technology and its impact on legislated access and privacy rights in Ontario.

Accordingly, the purpose of this paper is to provide an introduction to GIS technology for government organizations and the public, and to help create a greater awareness of the privacy and access issues associated with this technology. The first part of the paper attempts, in a non-technical way, to define the technology and to identify common characteristics. The next portion describes examples of GIS applications. This discussion is deliberately diverse and wide-ranging to help the reader understand the scope of the technology. The third section identifies some of the general issues being raised about GIS technology. The final two parts of the paper examine privacy and access concerns. These sections also identify the issues, as well as responsibilities, the IPC believes government organizations should consider prior to implementing a GIS in order to ensure that the technology does not threaten or diminish access and privacy rights in Ontario.

WHAT IS GIS?

GIS definitions tend to be lengthy and technical, as illustrated by the following, relatively straightforward, definition:

> A GIS is a database management system that facilitates the storage, retrieval, manipulation and analysis of spatial and temporal data and its display in the form of maps, tables and figures. The information in a GIS describes entities that have a physical location and extent in some spatial region of interest, while queries involve identifying these entities based on their spatial and temporal attributes and relationships between entities. Geographic data refers to spatial data in terms of their position with respect to a known co-ordinate system, their attributes (which are unrelated to their position) and their spatial inter-relationships with one another.[2]

In other words, a GIS is a computer system specifically designed to store, retrieve, and analyze geographically referenced information.[3] The term "GIS" seems to be difficult to define because it means different things to different people in different disciplines. Often it is defined by its component parts, by the characteristics of applications, or by what the system can do. It is acknowledged that this technology is complex and perhaps new to some readers. However, to have some insight into the potential of a GIS, it is necessary to understand the following characteristics of the technology:

- The data input or collection component of a GIS can convert data from existing forms into one that can be used by the system. Geographic information (also known as georeferenced data or geodata) used to be provided exclusively by paper or electronic maps, and tables of attributes. Today, images primarily from aerial photographs and satellites play a significant role in many GIS operations.

- Information for any geographic feature has four major components: its geographic position, its attributes, its spatial relationships, and time (i.e., where it is, what it is, what is its relationship to other spatial features, and when did the condition or feature exist). In addition to georeferenced data, a GIS can contain information, often called non-spatial attributes, not represented by locational information.

- For a GIS to function, relationships must be expressed in a computer-usable manner. It requires that a common co-ordinate system be used for all data. In practical terms, it is not possible to store all possible information about all possible spatial relationships. Instead, only some of the spatial relationships are explicitly defined in a GIS, and the remainder is either calculated as needed or not available.[4]

* Conversion of data to a format usable by a GIS is expensive, time-consuming and often difficult. This process is particularly onerous when data are from a wide variety of sources, with different geographic scales and levels of reliability. While new survey methods generate data in digital form, today there still remains an immense backlog of surveys and maps that have to be converted in order to be used in a GIS.[5] Conversion commonly represents 75 per cent or more of the total cost of implementing a GIS.[6]

* The data management component of a GIS includes the ability to store and retrieve information from the database. The methods used to implement these functions affect how efficiently the system performs operations. The structure of data and the organization of the database place constraints on the way, and the speed with which, data can be retrieved.[7]

* The analytical capabilities of a GIS may be used to answer questions about what exists now or existed at some point in the past. In addition, they can be used to predict what will happen at a future point in time.[8]

* The output or reporting function of GIS applications vary more in quality, accuracy, and ease of use than in capability. Reports may be in the form of maps, tables, or text in hard or softcopy.[9]

Manipulating and analyzing data referenced to a specific geographic location are key capabilities of a GIS. However, the power of the technology is most apparent when the quantity of data involved is too large to be handled manually or by other information management systems. When there are hundreds or thousands of features to be considered, or hundreds of factors associated with each feature or location, the large volume means it may not be possible to efficiently handle the data using other methods. When the data is input into a GIS, it can be easily manipulated and analyzed in ways that otherwise would be too costly, too time-consuming, or practically impossible to do.[10] This is the true appeal of GIS technology. It can make possible what was formerly impossible.

APPLICATIONS

GIS technology is now considered to be entering the information management mainstream.[11] Desktop computers have replaced the large mainframes once needed to combine and process data, making GIS products much more affordable and user-friendly. This, combined with various new software and design features, has meant that there has been a great expansion of the number and types of GIS applications in recent years.

In fact, GIS technology has developed so rapidly and extensively over the past two decades that some users now accept it as an essential tool for managing geographic information.[12] Supporters believe this technology will fundamentally change the way information flows within and between organizations.

The growing popularity of GIS applications is largely a response to the versatility of the technology. Outlined below is a description of some GIS applications. This discussion is by no means complete or current. Every day new applications are announced. However, the selection is designed to show, in a general manner, the extent and diversity of the technology, rather than to outline specific applications in Ontario.

Land Management/Conservation

The challenge of managing natural resources has been a major impetus in the development of GIS technology. A GIS has been used by the Canadian federal government in the area of land management since the technology's inception. The Province of Ontario Land Registration Information System (POLARIS), developed in co-operation with Teranet Land Information Services Inc., uses GIS technology and contains detailed information about the location and ownership of parcels of land across the province.[13]

GIS technology has been widely accepted by public forestry agencies and private lumber companies throughout North America. It is used to assess existing forest resources, to develop harvest schedules and treatment programs, to project future timber supplies, to model the spread of forest fires, and to plan other operational activities. Some of the data necessary for GIS analysis of forest inventories is collected using remote sensing techniques (e.g., satellites).

GIS and remote sensing technology is also used in the tracking of wildlife. As an example, a GIS has been used to monitor caribou and analyze location data, received from a satellite transmitter attached to a collar on the animal, to assess the potential impact of pipelines and other developments. Similar studies have been conducted to track other animals such as mountain sheep, elk, and polar bear.

GIS technology is also ideal for simulating events or developments that could endanger the environment. One such example is the use of a GIS by the Canadian Wildlife Service to study how an increase in the atmospheric carbon dioxide concentration and resulting global warming could effect the location and extent of ecosystems in Canada.[14]

The capabilities of the technology mean that governments are finding it to be an invaluable tool when developing policy relating to natural resources. For example, in the summer of 1996, the British Columbia government announced a new land-use policy for one of the province's regions. It was reported that the policy gained the support of over 20 special interests groups as diverse as environmentalists and loggers, in part, because a GIS was used at the negotiating table. The application enabled the claims of the different stakeholders to be modelled, analyzed and modified. It also enabled countless alternative scenarios to be developed and examined, leading eventually to the development of a land-use policy that balanced the various stakeholder interests.[15]

Organizations responsible for international land management and planning are also using GIS technology to support their data collection, analysis and reporting functions. In many cases, it is the power of a GIS that makes these types of projects possible and affordable. The work of the Co-ordinated Information on the European Environment (CORINE) program is an example of a large-scale international project. The objective of this project was to provide a comprehensive integrated spatial database of environmental information relevant to European policy-making. Another example is a GIS project designed to map and analyze the spread of desert areas around the world developed by the United Nations Environmental Program.[16]

Resource Management

There is a considerable variety of GIS projects in this area. Some people think that GIS applications could "revolutionize the management of human and material resources".[17] GIS technology is used in everything from analyzing the effects of space shuttle launches from the Kennedy Space Centre on the natural habitat in Florida, to noise abatement efforts at airports. To illustrate this type of application, two examples are provided:

- The Bangladesh Space Research and Remote Sensing Organization uses remote sensing techniques and a GIS in the management of coastal zones and water resources. Some of the applications are monitoring sea levels, fish populations, catchment water resources, drainage patterns, and land use. In addition, the GIS is now a critical part of a cyclone shelter program and a flood action plan.[18]

- In 1991, Canadian GIS technical experts and equipment were sent to the Persian Gulf to assist the clean-up of oil spills. A GIS enabled planners to make timely and effective decisions on the clean-up strategy and to monitor the environment as it returned to its natural state. Similar technology was used during the Exxon Valdez oil spill.[19]

Emergency Services/Disaster Response

GIS technology has proven to be particularly helpful in emergency and disaster planning as well as in co-ordinating response efforts. One highly publicized example was the use of a GIS by Dade County, Florida, to generate maps after the devastation of Hurricane Andrew in 1992. County GIS officials created maps showing curfew areas, trash burn areas, tent cities, Red Cross locations, portable toilet facilities, mobile kitchens, water distribution points, disaster application centres, burn treatment centres, and supply distribution centres. The Federal Emergency Management Agency, the Army and the National Guard used GIS information to help co-ordinate the flow of goods and services to hurricane victims as well as to perform storm damage assessments.[20]

GIS technology is also used in providing 911 emergency services. As an example, in one jurisdiction, when 911 calls come in, operators use the computerized maps to instantly show their origin. They can also display other information about the area, such as the location of fire hydrants and hazards. The system is also designed to help respond to chemical spills. The GIS permits weather information, as well as chemical name and release strength, to be analyzed, the area of evacuation identified, and a list generated of the names and telephone numbers of all affected homes and businesses.[21]

Medical and Health

In recent years, GIS technology has found its way into various medically-related applications. For example, American health organizations are using GIS technology with satellites to predict Lyme disease risk,[22] the World Health Organization studied the application of GIS technology to help control tropical diseases,[23] and Finland is using a GIS to highlight public health issues including heart diseases, breast cancer, and AIDS.[24]

One of the most widely documented medically-related GIS applications involved the City of Milwaukee. Early in 1987, Public Health officials observed an alarming number of reported lead poisoning cases. Health Department records identified the home address of each person affected as well as some socio-economic data about the patient. This information was processed by the City's GIS to analyze the problem.

Almost all of the reported cases in the study area were children younger than seven. Most of the children lived in older homes where they were exposed to lead paint. Using a GIS, census tracts with the most children under the age of seven and with the most homes built before 1950 were identified as areas in which a lead-based paint abatement program would have the greatest impact.[25]

A private sector example involves the Metropolitan Life Insurance Company (MetLife) which created a GIS (METGEO) in order to help manage its business in the United States. According to the GIS Manager for MetLife:

> One of the keys to the successful expansion of the company's managed health care business has been its ability to illustrate its networks of preferred health care providers in specific geographic regions...
>
> Managing a health care network is a task directly related to geography... Doctors practice at specific locations and members need to be close to both doctors and hospitals. With METGEO, we can see relationships between where doctors, hospitals and members are and where services need to be.

MetLife also uses METGEO as a marketing tool. MetLife produces maps that display diverse information for many different types of clients. To continue to quote the GIS Manager:

> METGEO allows us to show graphically where services are related to a possible member company. When our representatives go out to visit a prospective client, they can take maps that show the extent of the coverage we are offering. When our sales representatives first meet with prospective clients, we are able to create custom maps incorporating the addresses of their employees with the locations of our preferred providers.[26]

Public Interest

As the cost of GIS technology decreases and more geodata becomes readily available, applications that directly and solely serve the public may increase. One of the first applications in this area was Ralph Nader's Essential Information organization which used a GIS to help community groups in American cities find patterns in home loan discrimination and create an awareness of GIS technolog as a tool for citizen advocacy.[27] The United Way in one American jurisdiction used the technology t assess the need for its services, such as determining areas lacking services for battered children, and for demographic analysis, such as identifying the locations of low-income single parents.[28]

Transportation

Transportation network management is one of the fastest growing areas for GIS technology.[29] Governments are creating GIS applications for infrastructure planning and analysis, safety analysis, environmental impact assessment, construction planning and management, land use planning, projec engineering, snow plow route analysis, and emergency response management.[30] In addition, vehicle routing applications, especially involving commercial fleets, seem to be particularly popular.

Law Enforcement

Increasingly, law enforcement agencies are using GIS technology to help track and prevent crime, and to co-ordinate policing activities, including facilitating multi-jurisdictional efforts.[31] One GIS application enables users to plot the details of an incident -- the time and date of the crime, the weapon, and victim and assailant statistics -- against city maps, police beats, and other crime reports. Crime analysts can use the GIS program to play out different scenarios. In addition, by using the GIS with an automatic vehicle locator system to monitor the positions of patrol cars, emergency response is faster.[32]

Military

One of the applications critical to GIS development, but which receives limited coverage, is military. In the United States, GIS technology has been "heavily underwritten by a military agenda."[33]

The Gulf War has been called the first full-scale "GIS war." As one critic noted:

> It put geography on the public agenda in a quite palpable if impalatable way... The development of sophisticated computerized cartographic technology has ... definitively altered the way in which modern warfare is fought and staged and the way it is consumed by a global public transformed into video voyeurs.[34]

In Operation Desert Storm, pilots used a GIS on cockpit computers to locate targets. The United States military also used detailed GIS maps of Kuwait City made prior to the Gulf War to help assess bomb damage and restore power and telephone lines. In addition, CNN used GIS technology in its broadcasts to provide maps for battle simulations.

Commercial/Private Sector

Private sector or commercial applications are perhaps the fastest growing area for GIS technology. As it has matured and become more affordable, companies of all kinds are discovering the advantages of the technology.

In the private sector, the resource development industries lead the way with GIS applications, but increasingly other sectors like marketing, retail and wholesale sales, delivery services, real estate, and construction are using GIS technology.

To be competitive, companies need to know how customers, competitors, routes, markets, prices, suppliers, prospects, and even profits vary from one location to another. Businesses want to answer locational questions based on customer distribution, buying power, buying history, advertising efficiency, growth areas, competition distribution, least-cost routing, and delivery. Additionally, environmental concerns, sales distribution, and budget allocations are all organized and managed by geographic area.[35]

Business planners are taking advantage of sophisticated GIS capabilities to help make business decisions, cut costs, and increase efficiency. They have found that patterns, relationships and trends that may be difficult to recognize in columns of numbers or text become clear when viewed graphically.[36] For example, a movie distributor is using a GIS to analyze what kinds of films draw the best crowds in various neighborhoods.

One of the major commercial applications is retail location analysis. The use of a GIS for location analysis is not confined to selecting new sites or to closing existing sites -- merchandise mix, targeted customer groups, competition, advertising and distribution, all have direct locational relationships and change over time requiring repeated analysis.

As mass markets have declined, target marketing has become more of a necessity for business. For competitive advantage, marketers need to be able to handle geographical data efficiently, and increasingly they have recognized GIS applications as "useful and relevant tools in their armoury."[37] As an example, in the early 1990s, Equifax National Decision System announced the introduction of Infomark-GIS, America's "first fully integrated GIS system specifically designed for marketing applications and decision making."[38] At that time it was noted that:

> Infomark-GIS ... provides sophisticated marketing analysis and mapping capabilities that enable marketers to easily integrate their own internal customer, sales, and operations data with more than 60 national marketing databases. With an intuitive point-and-click interface, Infomark-GIS users can quickly and easily overlay proprietary information on current market data, analyze options, evaluate "what if" scenarios, and visualize results that are key to making better and faster decisions. In addition, Infomark-GIS offers optional automated applications that are customized to solve specific marketing problems common with the retail, restaurant, consumer products, utilities, and financial services industries.[39]

In addition, the amount, type, and timeliness of customer information has changed dramatically over the past two decades due to real-time point-of-sale data.[40] This rapid expansion of information has far outpaced the ability of traditional marketing systems to handle it. GIS technology delivers the power and flexibility needed to transform a mass of confusing data into an actionable marketing plan.[41]

Data used to be analyzed and then displayed spatially on a map as an afterthought. This situation is now reversed; the map has become the window through which data are accessed, providing the basis for queries, exception reporting, analysis, display, interpretation and execution.[42]

One of the more controversial but influential aspects of GIS technology in marketing is known as geodemographics. This technique is designed to allow organizations to anticipate the needs and desires of different segments of the population -- something that is of critical importance when attempting to persuade people to buy soup or vote for a candidate. While geodemographics or similar population breakdowns play important roles in many marketing applications, increasingly, it is being used in public policy-making.

Geodemographics was developed in the United States in the 1970s and is predicated on the basic assumption that "birds of a feather flock together." Despite people moving from one area to another, the economic and social characteristics of most neighbourhoods are remarkably stable. This stability means that information collected by a census can be used to define the social class and economic status of people living in most neighbourhoods.

A system of ranking neighbourhoods was developed by analyzing over 30 pieces of information about the income, education and make-up of anonymous representatives living in each of the census units of the United States. Information about the census units was consolidated down to the postal zip code areas in which they were located, and then each district was ranked on a social hierarchy. Jonathan Robbin, the sociologist credited with inventing geodemographics, named each rung of the social ladder (e.g., Blue Blood Estates, Furs and Stations Wagons, Bohemia Mix, or for the less elevated rungs, Bunker's Neighbours, Urban Renewal, Tobacco Roads and Hard Scrabble).

The oft-cited example of the success of geodemographics is a right-to-work struggle between labour and big business in Missouri in 1978. This was the first time Robbin used his geodemographic database directly for political purposes.

A computerized list of a million and a half telephone households in Missouri was purchased from a commercial supplier. Then each household was labelled by social class according to its location. A random sample telephone poll was conducted. The poll was large enough so that the views about the right-to-work issue of each of the state's social clusters could be predicted. Eighteen different letters about why the right-to-work law should be defeated were carefully designed to appeal to specific economic and social groups. This target marketing was instrumental in getting the right-to-work defeated by a two-to-one margin. This result was considered an abrupt turn-around in public opinion and shocked many politicians and reporters.[43]

Information Highway

It is now possible to deliver maps interactively directly into homes and schools using standard telephone lines,[44] and some GIS supporters think that the public's access to and use of geodata will likely increase as the information highway continues to develop. What makes GIS technology so suited to this integrated network is its ability to present complex data in an easily understood graphic form. The Council of Maritime Premiers recognized this critical relationship in the early 1990s when it adopted an economic development plan for the region's GIS industry as a component of its information infrastructure strategy.[45]

Municipal/Local Government

One of the areas where there has been significant growth in GIS use is with local governments. As most of the information needed to operate a municipality is georeferenced, the use of GIS technolog seems to many to be a logical choice. An Urban and Regional Information Systems Association review of municipal information in the early 1990s showed that more than 80 per cent is directly or indirectly geographically-based. Some people believe it would be difficult to identify municipal data without a geographic reference.[46]

Today GIS technology is widely accepted as both a modelling and decision support tool by local governments. Supporters believe that GIS technology can enhance analytical capabilities, produce information with "added value", and generate the implications of a large number of alternatives quickly. Consequently, GIS technology is seen as helping to facilitate planning and to enhance the decision-making process by providing a rich database.[47]

> The technology has now matured to the extent that cost-effective performance can be guaranteed. Rapid advances in computing performance and data storage media have contributed to GIS functionality. These same advances have dramatically reduced the costs of GIS, to the level where appropriate technical solutions are now well within the fiscal means of even the smallest municipalities. The ... industry has developed the necessary expertise and experience to assist local governments with GIS implementation. And finally, success breeds success -- the word is spreading about successful applications of GIS in local government. This gives prospective users of the technology the confidence to pursue their own applications.[48]

Municipalities use GIS technology to support such activities as facilities and property management, property appraisal, election management, permit and license issuing, subdivision planning, transportation analysis and planning, environmental analysis, vehicle routing and dispatching, emergency response, engineering design, water/sewer systems and electrical cabling inventory, and land use planning.[49] In Ontario, most of the larger municipalities such as Toronto, Scarborough, Mississauga, and the Regional Municipality of Ottawa-Carleton, as well as a number of smaller municipalities, have GIS applications.

One early and well documented GIS application in Ontario was the County of Oxford Land-Related Information System (LRIS) which provided the county and area municipalities, as well as the County Board of Health and Local Public Utility Commissions, shared access to a database of land-related information that had been integrated from a variety of government sources.

By integrating information from a number of federal, provincial, and local government databases, the system made useful and relevant information that otherwise would have been largely inaccessible and inapplicable. Moreover, this integration helped minimize the development costs of a land-related system for the county and municipalities, and provided a source of up-to-date and accurate data from other government levels.

As an example of how the LRIS was used, the City of Woodstock used it to analyze potential locations for a fire station by examining the street network to identify impediments to travel such as speed limits, stop signs and railway crossings. The system simulated the travel of the fire trucks through the street network. Data on actual fire calls was input to help determine categories and ages of structures susceptible to fire. In addition, facilities such as hospitals and nursing homes with large concentrations of people were also defined and mapped for the entire city. The analysis determined and ranked intersections that best reduced travel time to high risk and high cost buildings in areas unserviced by existing fire stations. The system further aided the search by analyzing potential locations in order to determine the size of land parcels, potential impact on existing development, and the ability of the site to contain the type of fire station design being proposed.[50]

While the purpose of most local government GIS applications is to make internal operations more efficient and cost-effective, some also focus on public access to government records. Often applications begin as in-house analytical tools and then, as the system matures, public usage and access develops.

As an example, one American jurisdiction developed an easy-to-use public access GIS system which became a prototype for similar efforts in government agencies across the United States. It allowed the public to view and print maps and ownership information using menus to guide them through the system. Permanent changes to the database were blocked by the program. Maps available to the public showed land parcel boundaries, soil types, woods, cleared land, and structure symbols such as residential, commercial, government buildings, mobile homes, schools or fire departments. Detailed photos also allowed users to view properties from overhead.[51]

GENERAL ISSUES

From the preceding discussion of applications it is clear that GIS technology is highly useful and adaptive. The general flavour of writing on GIS technology is extremely positive, however, it is not without its critics. They see a technology with a number of troubling technical and methodological problems. They also have grave concerns about seemingly limitless GIS applications, and what seems to them to be blind reliance on this technology to make significant social, economic, political and environmental policy decisions. This section identifies and discusses some of the general issues being raised about GIS technology.

Complexity of Technology

The complexity of GIS technology itself raises two fundamental concerns. The first is that the development of a GIS database is often done by a few highly technical people without public input. Critics think there is a need for more segments of society to be involved in the creation and development of GIS applications.[52]

The complexity of GIS technology also leads to a second and perhaps more serious concern. Many people who rely on a GIS do not see behind the "black box" and accept the information and analysis presented as fact, rather than as a selection or interpretation. Most users do not perceive errors or bias in a system.

There is a concern that a GIS, as with other complex computer systems, takes away people's ability to think things through for themselves. It is so complicated that most people do not understand how a GIS works, but they seem to have an innate faith in the machine and its logic. This lack of critical thinking and analysis is what some critics find troubling, particularly when GIS technology is utilized by public policy makers.

> Maps are attractive because they are visual and they stimulate the imagination, and perhaps also because they present the world as simpler, more orderly, and less dynamic than it really is. Computers are attractive because they give power to their users, convey prestige and status, and behave in orderly ways. Is GIS attractive because these two sets of factors are somehow complementary?[53]

To develop ethical and equitable GIS applications, critics think it is important to demystify the technology and to educate the public, potential policy makers, and other users about GIS technology and its underlying principles and limitations.[54] The more informed all users, including the public, are about GIS technology, and the more they participate in the development of applications, the better able they are to make informed decisions about the technology and its impact.

Lack of Planning/Cost Benefit Analysis

With any type of information system, careful planning prior to acquisition and implementation generally increases the degree of success and utility. Lack of planning increases the possibility of a mismatch between a system's capabilities and user needs, resulting in wasted money. Despite this, according to critics, there have been few independent cost benefit analyses of GIS applications.

Critics believe that GIS technology has been oversold in recent years, and that a more considered view of its applicability to substantive problems is needed. As one commentator noted:

> The rapid development of GIS in academia, the private sector and all levels of government has created a booster type atmosphere where critics have been scarce or dismissed as anti-progress. In the rush to join the GIS bandwagon taking stock of basic problems and defining limits have been rare...
>
> The size of the investment made, the urge to declare successes before delivery have not been sufficiently tempered by a willingness to admit this is a young, somewhat poorly defined and difficult technology.[55]

Limits of GIS Technology

One of the basic difficulties for any GIS application is how to define an object in the "real world" in a way the computer understands. In reality, spatial objects are often the products of interpretation or generalization, and geographic data is irregular and variable.[56] This irregularity requires point-by-point definition of each geographic feature in a GIS. Inherently, a GIS is an abstract model of the real world[57] because, when defining a spatial object for a GIS system, a selection process must take place.

Digitizing is more than just the simple act of translating information into a form that is readable by a computer. The digitizing process acts as a filter or constraint. A GIS database is necessarily incomplete and generalized -- it is selective knowledge. In addition, there may be a tendency, given the constraints of the technology itself, to exclude that which does not fit. Critics are concerned that the selection process, and resulting bias, are not always recognized by those using GIS data and analysis.

Like many technologies, a GIS imposes limits on thought and action as a result of its characteristic properties. These limitations have raised a concern about a phenomenon called "reverse adaption." Reverse adaption refers to the transformation of existing goals to accommodate a new technical means. Goals are rearranged in accordance with the demands of the technological order. In extreme cases, the broader social context ceases to be relevant as long as technological demands are satisfied and maintained.[58]

Changing the Nature of Decision-Making

Some commentators believe that the most significant impacts of technology tend to occur when it becomes indistinguishable from the fabric of everyday life. The most profound technologies are those that are so ubiquitous and commonplace that they are unconsciously accepted as somehow indispensable. They argue that technology's tendency to disappear into the background of everyday experience is essential to its ability to transform human thought and action. "The most significant impacts of technology therefore tend to occur when the technology has ceased to be a 'tool' and has become an integral and indispensable component of everyday life."[59] Some supporters believe that GIS technology is on the verge of such a transformation.

Today many organizations look upon GIS technology as an essential research, planning and decision-making tool. Supporters think that a GIS facilitates better decisions by providing access to more and better information and by rationalizing the decision-making process. Critics reject that notion and think that many users do not recognize that a GIS can change the decision-making structure. The use of a GIS inevitably shifts some emphasis toward more easily quantifiable factors and away from immeasurable ones.[60]

Perhaps the most significant concern is that a GIS can mislead users. Information can be distorted by how it is presented and by what is included or excluded. As one commentator noted, the real danger about GIS data is that people may come to believe it.

Another concern relates to the objectification of people. Categorizing individuals makes the world much simpler. The key question is when does that categorization, as done by geodemographics, become stereotyping and discriminatory.

Geodemographics is seen by supporters as an effective and lucrative application for GIS technology But there is a concern that, intentionally or not, a GIS can be used for social control. While it may be difficult to see this concern in a soil map or an analysis of animal habitats, there are real ethical issues arising from many GIS applications involving people and their rights. For example, a GIS could be used by an organization to make decisions about benefits or eligibility based on location, rather than on individual merit, which could lead to injustice, inequity or discrimination.[61]

Using a GIS to make decisions affecting eligibility for programs and services could, potentially, violate an individual's rights and reduce their autonomy. When eligibility decisions are made as a result of aggregated information or selected attributes, the burden of proof can be shifted. People a put in the position of having to prove how they differ from the "norm" and why they are eligible. Due process may also become an issue if geodemographics are used in public policy. It is difficult, not impossible, for an individual to challenge or refute a decision if that person does not have access to or knowledge of the technology or the information used to make the decision.

Another concern is the depersonalization of decision-making and how a GIS can promote a detached view of the world.[62] Critics think that by using a GIS, decision-makers may be less likely to incorporate subjective values and humanistic concerns in policy decisions because of the seeming remoteness of the world in which these policies apply.

Critics also believe that the enormous potential of computers in general, and GIS technology in particular, creates an inequity of power, control, and understanding, which in turn alters the decision-making process.

> Centralized control of computer data bases, such as a GIS, tends to increase the power of the bureaucrats, administrators, technical experts, and computer literate groups who use them at the expense of those who lack the expertise or access to these system. Policy-makers and the general public tend to view information as more accurate, more objective, and more current simply because it was computer-generated. Not only does the data appear more authoritative, the politically neutral language used to describe the data preparation, analysis, and results reinforces the air of objectivity.[63]

Neutrality of Technology?

It has been argued that the computer does not portend any significant qualitative change in thought or action, and its impact is limited to issues of speed, efficiency, and processing power. Tools are typically construed as neutral. Technological value is instead furnished by the use and application of a tool. The classic and rather dramatic example used to argue technological neutrality is the gun. A gun may be used for socially constructive purposes (protection and defence) or socially destructive purposes (violent crime), but the gun itself possesses no value. Applying the same logic to the computer, it can be viewed as value-free and its impact dependent upon the manner in which it is applied.

Critics believe the notion of a value-free technology is inherently misleading. They think that what the tool-based model ignores is the importance of the social context, and especially the profit motive, lying behind much technological innovation. It also ignores the possibility that technology may invent its own needs, and that technology may be built simply because the means to build it exist. The question of human need is not a prerequisite for technological innovation. Rather, innovation can be a goal in and of itself.[64]

Supporters of GIS technology see it as a way of gaining greater clarity and control over information and the world, while critics think this view amounts to technocratic myopia. They believe that implicit in the supporters thinking is the view that, if GIS technology permits the manipulation of data for particular ends, then the ends themselves are justified. Missing is any analysis of the ethical, social and political implications of such action.[65]

PRIVACY CONCERNS

The proliferation of advanced information technology, with databases containing vast quantities of information, is a source of concern to the public. Findings of repeated surveys show that Canadians believe their personal privacy is under siege. People feel vulnerable in the face of invasive and unrestricted information technology and practices. They are concerned that technology will jeopardize or override fundamental human values such as privacy and respect for individuals.

Information technology plays a significant, but not always obvious, part in virtually all aspects of modern life. With this increased role has come the systematic collection of information in an amoun and specificity never before possible. As one author noted: "No fact unrecorded, nothing forgotten nor lost, nothing forgiven."[66] In today's society, it is clear that information is a valuable commodity and a source of power. It has been noted that the computer gives to those in control of the technology the power to *know*.[67]

The accumulation and analysis of disparate pieces of information, and the construction of a fairly detailed picture of a person's life, seem to contribute to the public's general sense of alienation and the concern that "someone out there knows something about me."[68]

The creation of an "informational panopticon" makes people's lives visible to the outside world. It also deprives them of their ability to withdraw themselves from public view.[69] People feel, as more fragments of their lives are recorded and stored in databases, their privacy has been invaded, they have lost control over their personal information, and they are, in essence, under constant surveillance.

Privacy concerns are raised by GIS technology not only because some applications involve data about identifiable individuals (in the commonly understood sense of identification, i.e., data associated with someone's name), but also because it can create a powerful new identifier -- locatio The concern is that location can, in essence, become a personal identifier because GIS technology enables the synthesis and analysis of information not possible with other information management systems. It can construct a very detailed picture of an individual's life, even without the use of their name, just by collecting and analyzing data related to a specific location. It is this potential that is causing many of the privacy concerns associated with GIS technology.

What is Privacy?

Privacy is a highly subjective notion; its interpretation changes over time and space. It has been sa that privacy is "part philosophy, some semantics and much pure passion."[70]

> Privacy is ... a very personal notion. Within socially and culturally defined limits. privacy allows us the freedom to be who and what we are. The very fact that we are able to interact with others as we might like is because our privacy allows us that choice. By embracing privacy, we exercise discretion in deciding how much of our personhood and personality to share with others. We generally feel less vulnerable when we can decide for ourselves how much of our personal sphere they will be allowed to observe or scrutinize.[71]

Although there may be no universally accepted definition of privacy, in Canada there seems to be a common understanding that privacy should be valued and protected. Indeed, the value of privacy has been recognized by the Supreme Court of Canada:

> ... society has come to realize that privacy is at the heart of liberty in a modern state ... Grounded in man's physical and moral autonomy, privacy is essential for the well-being of the individual.[72]

There is also a common understanding that control over information about one's self is central to being a self-determining and responsible being.[73] The idea that information about oneself is one's own, to communicate or not to others as one determines is referred to as informational privacy,[74] and is a central tenet of all data protection schemes, including Ontario's. People feel that the loss of control over their own personal information has a significant impact on their ability to be autonomous.

In any discussion of privacy it is important to note that privacy is not an absolute right. Privacy must always be balanced against other needs of society.[75] In Ontario, the *Acts* are designed to provide guidance to government organizations on how to achieve an appropriate balance.

It is acknowledged that government needs to collect detailed information on its citizens in order to serve the public good and to accomplish its statutory mandates. It is further acknowledged that advanced information technology, such as a GIS, has the potential to provide many administrative efficiencies to government organizations. At the same time, it must also be acknowledged that with the use of a GIS there is the potential for abuse and for it to become a technology of surveillance and control. It is this potential, and the sense people have that they have lost control over their information, that are the primary focus of the privacy concerns relating to GIS technology.

Necessity and Relevancy of Information

One of the most basic concerns is that there is a potential for privacy invasion whenever large quantities of personal data are collected and stored. Two associated concerns are: 1) that these potential invasions may go undetected as it is not always immediately obvious what harm results from the computerized collection, use, and disclosure of data; and 2) that the computer has changed the nature, as well as the quantity of the information collected, used and disclosed.

Generally with improvements in information-handling capability comes the tendency to use more da and to discard less. This, in turn, motivates the collection of more data on more variables.[76] Contributing to this tendency is the fact that once a system has been established, the cost of collecting, storing and analyzing additional information is marginal. As one author noted about information technology generally:

> The peculiar qualities of information ... lead organizations ... to collect more information than is socially optimal. By the same token, because each isolated bit of information on the citizen ... has such a seemingly small "privacy cost" and because monitoring the bureaucracy's use of that information has a high cost, individuals are incapable of acting in their own interests.[77]

With GIS applications, one of the primary privacy concerns is that, as the technology can provide ar extremely convenient and cost-effective way to obtain, analyze and display data, more information than is necessary and relevant to lawful, fair and appropriate uses will be collected. A closely relate privacy concern is that the immense analytical abilities of GIS technology will create the opportunit for information collected for one purpose to be used for unauthorized purposes.

Most GIS applications involve the creation and utilization of enormous databases. As more information becomes available through GIS technology, organizations may be faced with the temptation to use that information, regardless of whether it is absolutely necessary or relevant to the task at hand. The fact that much of the information used in government GIS applications has been converted from hardcopy seems to exacerbate concerns about the use of information for unrelated and unauthorized purposes.

In the past, information was collected and stored in hardcopy to serve a particular purpose, for example, to register ownership of a property. With the conversion of that information and its inclusion in a GIS, it may be combined with other data and used for purposes not originally envisaged. For example, a municipal GIS may use the same information, in different ways, in its analysis for urban planning, scheduling of road repairs, and routing fire trucks. Without a GIS, som of that information may not have been used for these purposes because the compilation and analysis of the hardcopy information would have been administratively burdensome and impractical. The eas with which data can be combined and analysed with a GIS means that more information may be use to make decisions with the technology than without it. More significantly, it also means that information collected for one purpose may be used for other purposes, generally without the knowledge or consent of the data subject.

The IPC believes that there is a need to recognize that the use of more information does not always result in better decisions. Also, without forethought and careful planning, the very technology that enables a GIS to undertake detailed and varied analysis, can work to prevent selective exclusion or elimination of extraneous data.

Information Integrity

Another informational privacy concern relates to accuracy, completeness and timeliness of the geodata. Digitizing information for inclusion in a GIS is not simple and straightforward. As information is included or excluded to fit with the application, the accuracy and completeness of that information may be compromised. In addition the conversion of existing records, without verifying the accuracy of the information with the data subject, may mean that the quality of the newly digitized information is poor as it is out-of-date or incomplete. Data quality is essential when a GIS is used to make decisions that, potentially, could adversely impact the data subject. Without accurate information, any potential operational efficiencies or benefits, as well as the data subjects' informational privacy, may be compromised.

Knowledge and Consent

The capability of a GIS to compile, combine, and analyze information in a manner never before possible creates another privacy concern. The "ability to assemble information selectively, or to correlate existing information, can be functionally equivalent to the ability to create new information."[78] By using a GIS an organization can, in essence, create new personal information without the data subject's knowledge or consent.

Lack of knowledge or consent by the data subject is an issue that comes up repeatedly in discussions of privacy concerns related to GIS technology. One of the first problems is that although a GIS application takes a great deal of time and money to design and implement, generally government organizations do not consult the public about the appropriateness of the technology or how it is going to be used. This means the public does not have the opportunity to become informed or to object to the introduction of this powerful technology. It also means that potential data subjects cannot consent to the use of information relating to them or to withdraw that consent.

When a GIS application utilizes information already in an organization's custody or control, with no new direct collection or notification, the existence and use of the technology may not be known to the data subject. This creates a number of informational privacy concerns. First, data subjects are unaware of how their information is being used. This lack of awareness means that the process is not open and transparent, and that data subjects are not in the position to make informed decisions. It also means that data subjects may not have access to their records on a GIS and may not have the opportunity to inspect or correct that data.

In addition, it is possible that even if a data subject makes a request for their information, a GIS may not be able to provide the requested information because the application was not designed to pinpoint information on specific individuals. This is an issue with many types of electronic records and one that government organizations should consider in the initial design stage, as the ability of individuals to have access to their own information, regardless of how it is stored, is an essential fair information practice.

Private Sector Involvement

Another privacy concern is raised because: 1) government organizations are increasingly able to purchase personal data collected by the commercial sector and vice versa; 2) some alternative servi delivery models may transfer the custody or control of records to the private sector; and 3) due to the expense of GIS applications, public/private partnerships for such ventures are not uncommon. All of these factors contribute to the increased blurring of boundaries between public and private collection, use and disclosure of data.[79] As there is no data protection legislation for the private sector currently in place in Ontario, there is the concern is that this blurring might create the potenti for abuse as it might expose people's private lives to the view of unauthorized persons who could u the information to make adverse economic and social decisions about them.[80]

Public Awareness and Expectations

It has been argued that a GIS application designed for internal government use is a matter of administrative efficiency and, therefore, the public need not be party to the decision-making process. It has been further argued that geographic information should not raise personal privacy concerns because it is factual information about land and resources and, therefore, by definition is not about identifiable people. However, others think the strong data integration and analysis capabilities of GI technology, combined with the fact that most GIS data are inherently local in nature, means that the technology has the potential to be far more privacy invasive than many other information technologies.[81] These differing views have lead to widely divergent expectations on what, if any, privacy protection is required for GIS records.

People tend to think their privacy has been invaded when their expectation of privacy is not met. When an organization introduces GIS technology it can create a drastic shift in information practices. When this shift is not communicated to the data subjects, their expectations may be out-of-step with reality, and they may feel violated and betrayed by the organization. As an example, people give certain information relating to themselves to government on the understanding that the resulting records will be publicly available. However, when they are unaware of the type of technology involved with those records or the potential of that technology, many people may have an expectation that their "public" information will be somewhat private. In one sense, despite today's electronic environment, people still have faith that the inefficiency of voluminous paper records will protect their privacy because the process of tracking down "public" data specifically about them is extremely onerous and difficult.

When government records are digitized for a GIS, not only are informational privacy issues raised that are not present with the hardcopy records, but the very use of GIS technology can impact the relationship between citizen and government. It can shift the balance and expectations within that relationship by increasing the power and control of government organizations. Accordingly, the IPC believes that until this technology is widely understood by the public, government organizations have a special obligation to make their GIS operations as open and as transparent to the public as possible and to educate the public about this technology and its implications.

New Challenges

In Ontario, one of the purposes of the *Acts* is to protect privacy of individuals with respect to their personal information held by government organizations. The *Acts*' privacy provisions codify accepted fair information practices and provide a framework for the protection of informational privacy with respect to government-held information. The IPC believes that the careful and conscientious application of these provisions can help organizations address the privacy concerns associated with GIS technology.

In today's electronic environment, issues that did not exist with hardcopy records are coming to the forefront, and new information technology is creating new challenges for government organizations. In particular, the electronic environment means that the application and interpretation of the *Acts*' privacy protection provisions are not always simple and clear-cut. As an example, two issues that should be re-examined in the context of GIS technology are: 1) what constitutes personal information; and 2) should privacy protection be applied to public records.

GIS technology highlights the transformative nature of electronic records. It creates new types of records and enables analysis never before possible. This means information that traditionally has not been thought of as personal in nature, or that has been publicly available without adverse effect, can take on a new and privacy-sensitive character when digitized and combined with other data using a GIS. People who provide information to the government never imagined, much less consented to, the ways in which their information can be used in a GIS.[82]

GIS technology permits data to be aggregated and disaggregated in new ways, resulting in an expanded ability to identify individuals and their property. When the isolated pieces of information in a GIS database are drawn together, a very detailed picture of a specific location and the people associated with that location can be created. This creates the potential for privacy invasion not associated with paper records or with the disaggregated information.[83]

As noted above, much of the criticism directed at GIS applications centres around the fact that information is collected, used, amalgamated, and disclosed without the data subject's knowledge or consent. Regardless of whether GIS databases are composed of public records or not, some privacy advocates see these practices as a direct violation of fair information practices.

They argue there are informational privacy interests in data that are public. They believe that privacy interests are altered, or increased, when publicly available information in hardcopy is compiled and computerized so that it is available from a central and searchable source. It is thought that there is a significant difference between public records that might be found after a diligent search of hardcopy records in many locations, and a computerized summary located in a single clearinghouse of information.[84]

In the postscript of Order P-1316, Commissioner Wright noted that the sheer enormity of the task of finding information on an individual from hardcopy public records makes it unlikely that the information would be used other than for purposes for which it was collected. Citing the United States Supreme Court, the Commissioner described this as privacy protection based on "practical obscurity." The Commissioner concluded that:

> ... in order for government organizations to determine what personal information should be publicly available electronically, a new test is needed - what I have heard described as putting the information to the "Internet Challenge." This test would involve an assessment of how the public would respond if the information was available on the Internet where quite literally anyone in the world would have access to it. If the sense was that the public would respond negatively, the information should not be made publicly available in identifiable form in an electronic format...
>
> In a world of electronic information, "practical obscurity" is no longer sufficient protection for publicly available personal information since in reality, it no longer exists. Indeed, the availability of information electronically creates an urgent need to address the overriding question -- just how much is someone else entitled to know about you?

Proactive Approach

Without careful analysis and planning, the use of GIS technology may violate informational privacy by the collection of irrelevant information; the use of information for unrelated purposes; the collection, use, retention and disclosure of inaccurate data; the potential collection, use or disclosure without the data subjects' knowledge or consent; the lack of access and ability to correct information; and the lack of opportunity for data subjects to participate in decisions relating to their information.

Often both technology and privacy are viewed as being desirable, but as standing in a zero-sum relation to each other.[85] The IPC thinks that protection of privacy should not be viewed as an impediment to the adoption of GIS technology. Rather, with the consideration of privacy during the design of an application, rather than after implementation, both privacy protection and product or service delivery can be enhanced. The IPC believes that GIS technology can be managed so that government organizations and the public can enjoy both its benefits *and* ensure that privacy has not been unduly compromised.[86]

It is the organization, rather than the data subject, that controls the functions and parameters of the system, and determines what information will be collected, used, retained, or disclosed. Therefore, it is also the organization that bears the responsibility for ensuring that all GIS applications recognize informational privacy issues and are designed and implemented in accordance with established fair information practices.

Experience has shown that it is extremely difficult and expensive to retro-fit complex computer systems with privacy protections. Accordingly, the IPC recommends that government organizations take great care when designing and implementing a GIS application and proactively consider the applicability of the *Acts'* privacy provisions, as well as the more general informational privacy issues, prior to introduction.

Privacy Protection Principles

One of the purposes of this paper is to help government organizations recognize and understand that the potential impact of this powerful and transformative technology is significant, and with its implementation comes a responsibility to anticipate and address privacy issues.

In Ontario, government organizations are committed to the protection of privacy through compliance with the *Acts*. While the *Acts* provide an effective framework for considering and addressing many of the potential violations of fair information practices that may arise with a GIS application, there are some over-arching privacy issues associated with the technology that government organizations also need to consider.

To assist government organizations in their assessment of the privacy issues raised by GIS technology, the IPC offers the following fundamental principles for consideration. They are general in nature and are designed to supplement, not replace, the specific privacy provisions of the *Acts* and associated regulations.

- Government organizations should recognize protection of privacy as a central underlying tenet of any program or service involving GIS technology. Before introducing any GIS application, potential privacy issues should be explicitly identified and the impact of the proposed application on privacy assessed. Appropriate and effective privacy protective measures (technological, legislative and policy) should be developed and implemented.

- Government organizations should only use GIS technology to enhance government programs and services, and not as an instrument of social control or surveillance.

- Government organizations should collect, use, retain, and disclose data in an anonymized or aggregate format whenever possible in their GIS applications.

- Government organizations should recognize that information associated with a specific location may be privacy-sensitive.

- Government organizations should ensure that their GIS applications are open and transparent to the data subjects, and that the data subjects are aware of the existence of any technology or record-keeping system impacting their personal information.

- Government organizations should recognize the data subject as the owner of their personal information, and as a key stakeholder to be consulted when contemplating the introduction GIS technology or the development of policies or practices that could potentially impact th privacy.

- Government organizations should provide public education identifying any privacy issues associated with the use of GIS technology, prior to implementation. They should also communicate their privacy protection policies and practices to the public in a manner that enables the public to exercise its rights.

- Government organizations should govern their GIS practices related to identifying information by established fair information practices, regardless of whether that information considered "public."

- Government organizations should conduct in-house education about the privacy implications of GIS technology for all staff involved in the development of the application or the delivery of related programs and services.

- Government organizations should communicate their privacy protection policies and practices regarding GIS applications to all staff, and make staff accountable for adherence to those policies and practices.

- Government organizations should ensure that, if a proposed GIS application has the potential to modify information processing practices in a way that might compromise existing levels of privacy, appropriate methods of restoring any lost degree of privacy are provided, at no cost to the data subject, unless compelling reasons for not doing so exist and can be demonstrated

- Government organizations should review their GIS-related privacy policies and practices on an on-going basis to ensure that they are appropriate, effective and responsive to current privacy expectations, legislation, and technology.

- Government organizations should not withdraw access to essential services or products if the data subject refuses to permit the use of their personal information in a GIS for a purpose not identified at the time of collection, including the exchange or sale of personal information to third party for marketing purposes.

- Government organizations should stipulate, in their contractual agreements, with private sector partners: (1) the privacy protection measures to be adopted when using their GIS data (2) the purposes for which that information may be used and disclosed by their business partners, and (3) the penalties for misuse.

The IPC recommends that these fundamental principles be viewed as the foundation upon which government organizations should build their GIS applications. Consideration of these principles

should start as early in the evaluative and developmental process as possible and should continue throughout the implementation of the system. Building on these principles means government organizations need to determine if their proposed applications could jeopardize privacy. The *Acts* provide an excellent basis for that assessment and can help organizations identify the necessary steps to be taken in order to protect privacy.

The IPC believes that any government organization contemplating the adoption of GIS technology should be proactive in its approach to privacy. Therefore, rather than reactively considering the *Acts'* privacy protection provisions in response to a request or complaint, the IPC recommends that, at the earliest possible time, government organizations look to the *Acts* for guidance and use them as a kind of checklist. As a starting point, answering the questions outlined in Appendix A should help government organizations determine the potential impact of a GIS application and identify areas that need to be addressed to ensure compliance with the privacy provisions of the *Acts*. The IPC believes that approval of a GIS should be contingent upon a demonstration that privacy will be adequately and appropriately protected.

Finally, it is important for government organizations to understand that GIS applications do not exist in an information vacuum. GIS technology exists alongside other advanced information technology and developments such as the computerization and tracking of people's purchases, bank transactions, credit histories, telephone calls, medical records, education and employment histories, in addition to the "information highway" with its automatic recording of transactions. When considered as a whole, government organizations can begin to understand people's apprehension about advanced information technology.

It is this whole complex of information-gathering -- the informational panopticon -- that threatens people. Some might argue that it is unfair to GIS technology to consider it in light of other technology and accumulated data. On the other hand, it may be the only way to see the threat accurately.

> The reason is this: We have privacy when we can keep personal things out of the public view. Information-gathering in any particular realm may not seem to pose a very grave threat precisely because it is generally possible to preserve one's privacy by escaping into other realms. Consequently, as we look at each kind of information-gathering in isolation from the others, each may seem relatively benign. However, as each is put into practice, its effect is to close off yet another escape route from public access, so that when the whole complex is in place, its overall effect on privacy will be greater than the sum of the effects of the parts.[87]

ACCESS CONCERNS

The concept of any person being able to access government-held information is one of the fundamental principles of accountable government and participatory democracy.[88] This ideal is reflected in the *Acts*, which provide that, subject to limited and specific exemptions, information under the control of government organizations should be available to the public.

However, in some jurisdictions there seems to be an increasing tension between the public's right to access government information, as established by freedom of information legislation, and the government's desire to capitalize on the commercial value of that same information. In both Canada and the United States, when many freedom of information laws were written, the commercial utility of government data was largely unrecognized. Now government information is seen as a potentially profitable commodity, with a substantial number of tax dollars invested in the development and maintenance of technology and databases.[89]

It is recognized that in Ontario government organizations are committed to the principle of public access under the *Acts*. To further the spirit of that underlying principle, the IPC continually encourages government organizations to be more proactive in their approach to public access.

Part of a proactive access approach should include the on-going involvement of the public into the development and maintenance of GIS applications. This is just as important for access as it is for privacy. Such an approach will not only increase the public's understanding of the technology, thereby allowing people to make more informed decisions, but it could also help enhance the integrity of the geodata and, in turn, the effectiveness of the GIS.

The IPC believes that one of the key benefits of a proactive approach is that it can engender a more open relationship between government organizations and the public they serve. The IPC also encourages organizations to explore multiple or alternate formats for the release of information so that it can be truly accessible to all.[90]

It is in this context -- of fostering and promoting greater public access -- that the access concerns associated with GIS technology are discussed here. These concerns are similar to those raised by other types of electronic records. What makes GIS technology unique is the size and detail of the associated databases and the high demand and marketability of this type of information.

As noted in the Application section of this paper, the capabilities of GIS technology mean that it can be effectively used to enhance public access to government-held information. The primary purpose of this discussion is to highlight for government organizations the access issues related to GIS technology generally, and to note some of the new challenges they may face when considering public access to GIS data.

Potential Technological Barriers

With GIS technology, as with other types of information technology, there is a concern that those people without the necessary hardware and software will be effectively barred from accessing the information stored by that technology. The concern is that if public access considerations are left out of the technology debate, a society of information "haves" and "have-nots" may be created.

The IPC believes that government organizations need to be mindful that the very choice of technology can impact the ability of the public to access government information. To the extent electronic formats are seen to have distinct advantages (e.g., in terms of timeliness or searchability), those without electronic access may be disadvantaged.[91] For information to be only available through a GIS means that without access to that technology, an individual may be denied access to government-held information.

In the general sense of the word, access means that there must be a reasonable and meaningful way to review or acquire the information on the part of the individual who seeks it. Accordingly, it is important to understand that a paper copy of a record may be the only meaningful format for a requester without access to a computer or without the necessary technological skills. In comparison, a requester with the technological capability to manipulate an entire database may find a paper copy of records meaningless.[92] In addition, the fact that information may be available on a record-by-record basis for a set per record fee, may not satisfy a request for the entire database or for selected data fields. Therefore, the IPC believes that with the introduction of a government GIS comes the associated responsibility of providing, whenever reasonably possible, requested information in an alternative format or providing the public with a point of access to the necessary technology at a reasonable cost. The IPC believes that no single format can adequately support the basis of Ontario's access scheme -- only with variety, choice, and flexibility in delivery and format of information products, can access be nurtured.[93]

Another potential barrier to electronic access may be created if the deletion or severing of exempt information under the *Acts* is not addressed in the design of a GIS (i.e., entire record may have to be exempted if a means to sever is not available).[94]

It is acknowledged that a government organization cannot anticipate every possible type of request for GIS information and cannot provide all information in every possible format. But by considering, in a general manner, public access to information and the possible ways in which GIS data may be requested prior to implementation (e.g., entire database, record-by-record, or part of a record), the IPC believes that government organizations should be able to design their GIS applications with sufficient flexibility to accommodate as many different types of requests as is reasonably possible. The IPC encourages organizations to give consideration to the public's right to access government-held information, and to limit any technological factors that may diminish that right.

Cost Issues

The cost of developing and maintaining GIS databases and the marketability of these records raise other concerns about public access to government information. The basic concern is that public access may be restricted by the ability to pay. It is acknowledged that the same may be said of some hardcopy records. However, the market value of GIS data, and the attempts to maximize the revenue-generating potential of these records, elevate this concern to new heights. Also, there is the associated concern that if the principles of the marketplace are allowed to supersede access rights, much of the information that is now publicly available could disappear if it is not sufficiently profitable.

From the perspective of government organizations, there seem to be two central cost issues: how to recover some of the costs of developing and maintaining GIS databases, and how to appropriately recognize the commercial value of these records and use them to generate revenue. Both these issues could, potentially, create significant economic barriers to public access.

Cost Recovery

Some jurisdictions support the establishment of additional user fees for GIS records in an attempt to recover some of the developmental and overhead costs associated with providing access to these records. As an example, in 1990, Alaska enacted a comprehensive revision of its public records law to incorporate electronic information. One notable provision of the law -- unique among states at the time -- authorized state and municipal agencies to offer "electronic services and products" for a fee to recover costs associated with creating a GIS or other public information system. The definition of electronic services and products included maps, standard or customized products from a GIS. The law provided that "the fee for electronic services and products must be based on recovery of the actual incremental costs of providing the service or product," plus a "reasonable portion of the costs associated with building and maintaining the information system of the public agency."[95]

Proponents of these fees see them as a way to recover a fair share of the cost of providing information and services from those who receive a direct benefit from them. They view them as increasing equity by shifting some of the taxation burden from the general population to the individuals who use specific government activities or services.

Critics of such fees object to the "double taxation" element. Their position is that members of the public have already paid once for government services or information through their taxes and to ask them to pay again when they want access is just another form of taxation. From the results of American surveys of GIS applications they conclude:

> Considering the costs incurred by the GIS agencies in instituting and servicing revenue generation approaches, the argument that charging for data allows a GIS agency to reduce the burden on the local taxpayers by charging users is unsupported by ... survey findings. The costs recovered in proportion to the overall GIS agency annual budgets typically appear to be negligible or offset by the costs to service the revenue generation policy.[96]

Commercial Value

In a number of jurisdictions there seems to have been a fundamental shift in thinking from the principle that the free dissemination of information benefits everyone and, therefore, information is too valuable to be sold, to one that maintains information is, in fact, too valuable to be given away. In this information age, there is a continuous morphosis of information into services and products, data into information, and information in the private sector to information in the public sector. Some people believe that it would be irrational to say that when this "economic energy" is in one state, it has value, but in another, it does not.[97] Accordingly, some American jurisdictions are attempting to recognize the market or commercial value of GIS data and to charge the public accordingly. Other states have concluded that the market value of GIS records should have no bearing on their cost to the public, and that they should not be expected to generate a financial return.

In Ontario, at the time of writing, the Management Board of Cabinet's *Managing Intellectual Property* directive requires that ministries ensure the public has access to "basic information" free of charge or at a reasonable cost. Basic information is defined as critical to the delivery of a ministry's mandate, such as information the government is required by legislation to collect and make available to the public.

The counterpoint to basic information is "tradeable information." This is information that may have commercial value and can be publicly released under the *Freedom of Information and Protection of Privacy Act*, or any other legislation or policy concerning access to information. Under the directive, Ontario government organizations are to charge fees based on market value to cover related costs when government intellectual property is released for commercial use. Included in the definition of intellectual property are maps, drawings, photographs, statutes, regulations, software, diagrams, engineering drawings, architectural designs, research and development findings -- much of which would form the basis of a GIS database.

The *Managing Intellectual Property* directive makes a distinction between accessing and using information. Providing access to information means either giving or selling the right to an individual or organization outside the government to access (i.e., read, but not copy) information. Providing access to information does not include intellectual property rights, such as the rights to copy and redistribute for commercial purposes. The right to use government information may be granted only through licenses issued by the Queen's Printer. Licences must specify the rights a licensee acquires to government intellectual property, such as the right to use, make back-up copies, have multiple users, redistribute, or resell.

The directive also states that the incremental cost of preparing intellectual property for release should be borne by those requesting the intellectual property, rather than by the taxpayers at large. Intellectual property should not be licensed for third party use unless the fee charged is greater than the incremental cost of preparing the intellectual property for release.[98]

In general, the IPC's concern about high fees for GIS data is that they could, potentially, increase the percentage of the public that will not be able to afford to pay for these records, thereby limiting public access to government GIS products, services or information. The IPC is also concerned that since GIS data is increasingly being used in public policy, high user fees for this type of information may hamper public accessibility to information that sheds light on governmental decision-making and accountability.[99]

Private Sector Involvement

Another potential cost-related concern arises when government GIS information is distributed by private companies. Increasingly, government organizations are contracting with private sector vendors to provide government information, usually in computerized form, to members of the public. There is a concern about the amount of the fees private sector companies may charge or the conditions they may impose on the public attempting to access the information.[100] To address this concern the IPC maintains that any private sector involvement in government GIS applications should be accompanied by an assurance that the public's access rights are not reduced.

Ownership of GIS Information

The issue of information ownership and the applicability of copyright is another difficult access-related issue surrounding GIS records. Copyright, as defined in Canada's *Copyright Act*, is the exclusive right to copy, directly or indirectly, all or any substantial part of a "work." Copyright also includes the exclusive right to communicate the work and to authorize others to copy or communicate all or a substantial part of the work.

> There is no copyright in a single piece of information such as a bridge elevation. However, when information such as shape, dimension, locations and materials are compiled, the collection becomes a "work" which is capable of copyright protection. Copyright applies to the expression of an idea or concept and not to the idea or concept itself...
>
> The *Copyright Act* extends to "literary works" (which term includes tables, compilations, translations and computer programs) and "artistic works" (which includes drawings, maps, charts, plans and photographs). GIS databases are composed of "literary" (tabular) and "artistic" (graphical) elements. The *Copyright Act* use of the term "work" suggest that some degree of skill and effort is needed to transform pieces of data into a compilation. Thus, as long as the database is an original work, is the product of the author's effort and skill, and is fixed in a tangible form, then copyright exists in that compilation.[101]

In its review of copyright case law, the IPC found two consistent threads running through the cases:

1. The basis for copyright protection in compilations of factual data lies in the originality or creativity found in the compiler's selection and arrangement of the data; and

2. While the originality of the selection and arrangement of factual data need only be minimal to attract copyright protection, no matter how original, copyright protection will not extend to the underlying or "raw" factual data which is "discovered," not "created," by the compiler of the information.[102]

The digital age has necessitated a re-examination of Crown copyright and has been the subject of recent public discussion, both in Canada and abroad. As an example, in the Final Report of the Information Highway Advisory Council, *Connection, Community, Content: The Challenge of the Information Highway*, the Council noted that ensuring universal and easy access to public information on the Information Highway does not require the abolition of Crown copyright, but instead requires a more liberal approach to make works of the Crown available to the public. The Council argued that government should adopt a more flexible policy with respect to Crown copyright and should make a greater effort to make public information available without requiring payment or prior authorization. Additionally, where Crown copyright is asserted for generating revenue, licensing should be based on the principle of nonexclusivity.[103]

Critics of copyright in the context of electronic records have argued that enforcement of copyright limits access to and dissemination of government information to the public. They think it permits governments to refuse to publish particular documents, and can also allow governments to use monopolistic pricing practices that could work to limit the ability of some individuals to afford access to government information.

The copyright of computer software, whether agency-created or developed and copyrighted by a third party, also has raised access concerns. By controlling access to the software, one can control access to the data that software manipulates. Joint GIS applications raise additional copyright questions such as:

- Who "owns" the copyright of specific surveys, maps, plans or other underlying "works" comprised, or intended to comprise, the database?

- As a GIS database consists of a compilation of various original work, who owns the copyright in the actual database, particularly where copyright of the underlying work is not owned by the creator of the GIS application (e.g., a municipality using data created by Statistics Canada)?[104]

Also, given that a GIS database will be subject to constant revisions and updates, some might argue that each revised or updated version should be entitled to copyright protection.[105] There are also diverse issues relating to constructed databases (developed) versus acquired databases (purchased). These issues can be even more complex when acquired databases are used in conjunction with constructed databases.

The development of GIS databases generally involves significant selection and arrangement of data, not to mention the development of application-specific software. Therefore, the potential application of copyright protection to GIS databases and software, could have an impact on the public's right to access to government-held GIS data. Accordingly, the IPC encourages government organizations to ensure that public access to GIS data is not unreasonably restricted by copyrighted elements.

Access Principles

One of the purposes of this paper is to help government organizations become aware of the access concerns associated with GIS technology. When adopting technology like a GIS it is important for government organizations to see beyond the commercial value of the data, and to understand that public access to government information is a foundation of accountable government. It is recognized that this technology presents new challenges to government organizations. However, given the potential and growth of GIS technology, the IPC believes that government organizations need to consider the impact a GIS could have on access, and to make every attempt to design their GIS applications in a way that enhances the public's access right.

The IPC maintains that government organizations should see themselves as the custodian or trustee of the information they hold. They need to take care to ensure that issues such as commercial value and copyright of GIS data, do not erode public access. The primary concern is that, without considering access issues (e.g., what information should be accessible, to whom, in what circumstances, at what cost, and in what format) during the planning and design of a GIS, the system itself can function as a *de facto* barrier to public access of government information.

As with the privacy concerns, to assist government organizations in their assessment of the impact a potential GIS application could have on access to government information, the IPC offers the following fundamental principles for consideration. Again, they are general in nature and are designed to supplement, not replace, the specific access provisions of the *Acts*.

- Government organizations should recognize public access to government-held information as a central underlying tenet of any program or service involving GIS technology. Before introducing any GIS application, the impact on access should be identified and assessed. Appropriate and effective measures (technological, legislative and policy) should be developed and implemented.

- Government organizations should use GIS technology to enhance access to government-held information. They should look to the introduction of GIS technology as a way of increasing the amount of information that is routinely distributed or actively disseminated.

- Government organizations should ensure that all GIS applications are designed in such a way that the public can exercise their access rights in a meaningful and timely manner.

- Government organizations should provide public education on their GIS applications to ensure that the public can exercise their access rights in a meaningful and timely manner.

- Government organizations should conduct in-house education about the access implications of GIS technology for all staff involved in the development of the application or the delivery of related programs and services.

- Government organizations should ensure that the complexity or cost of GIS technology, the commercial value of the data, fees, or copyright, do not become an unreasonable barrier to public access to government-held information.

- Government organizations should ensure that private sector involvement in GIS applications does not reduce public access to government-held information.

- Government organizations should ensure that their GIS databases are as accurate, complete and up-to-date as is reasonably possible.

- Government organizations should ensure that the use of GIS technology does not adversely affect the records management or retention of government information.

- Government organizations should review their GIS-related access policies and practices on an on-going basis to ensure that they are appropriate and effective.

Although a GIS can offer great flexibility in how data can be used and manipulated, it can only do what it is designed to do with the information it has available. The IPC maintains that, due to the complexity and magnitude of GIS technology, access principles and the provisions of the *Acts* cannot be tacked on as an afterthought; they must be key considerations during the selection of the technology, the design of the application, and the development of associated information management policies and practices.

ENDNOTES

1. The *Municipal Freedom of Information and Protection of Privacy Act* uses the alternate wording of: "decisions on the disclosure of information should be reviewed independently of the institutions controlling the information". For simplification and ease of reading only the wording of the *Freedom of Information and Protection of Privacy Act* is cited in the body of this report.

2. Greg Radford, "Watershed Planning Using a GIS to Make Sustainable Decisions," Plan Canada, July 1993, p. 19.

3. Raphael Sussman and Brent Hall, "Municipal Planning and GIS," Plan Canada, July 1993, p. 8.

4. Stan Aronoff, Geographic Information Systems: A Management Perspective (Ottawa: WDL Publications, 1989), pp. 162-163.

5. Roger F. Tomlison, "Canadian GIS Experience," CISM Journal ACSGC, Vol. 43, No. 3, Autumn 1989, p. 228.

6. Aronoff, A Management Perspective, p. 282.

7. John C. Antenucci, Kay Brown, Peter L. Croswell, Michael J. Kevany with Hugh Archer, Geographic Information Systems: A Guide to the Technology (New York: Van Nostrand Reinhold, 1991) p. 9.

8. Aronoff, A Management Perspective, p.189.

9. Ibid., pp. 42-43.

10. Ibid., p. 2.

11. Leo Gotlieb, "Information Management," CMA Management Accounting, Vol. 68, No. 2, March 1994, p. 9.

12. Aronoff, A Management Perspective, p. 1.

13. Tony Martell, "Polaris puts virtual Ontario on-line," The Globe and Mail, November 12, 1996, p. C2.

14. Aronoff, A Management Perspective, pp. 8, 11-13, and 20.

15. Jerry Zeidenberg, "Local governments get good mileage from Canada's GIS innovators," Technology in Government, January 1996, p. 10.

16. Aronoff, A Management Perspective, pp. 21 and 24.

17. "A User's Guide to GIS," IDRC Reports, Vol. 20, No. 4, January 1993, p. 12.

18. A.A.Z. Ahmad, "Remote Sensing and GIS Application in Coastal Zone Management and Water Resources," Ecodecision, January 1994, pp. 79-80.

19. Energy, Mines and Resources Canada, "EMR Sends Additional Aid to Persian Gulf," News Release, April 15, 1991.

20. ARC News, Vol. 14, No. 4, Fall 1992, p. 1.

21. "GIS Improves 9-1-1 Services," ARC News, Vol. 15, No. 3, Summer 1993, p. 13.

22. "Team Tracks Ticks with Satellite Imagery," GIS World, Vol. 8, No. 7, July 1995, p. 16.

23. "GIS in the Republic of Botswana," ARC News, Vol. 15, No. 2, Spring 1993, p. 28.

24. Andrew Safer, "Record crowd attends GIS conference," Atlantic Business Report, December 1993, p. 16.

25. William E. Huxhold, An Introduction to Urban Geographic Information Systems (Oxford: Oxford University Press, 1991), p. 117.

26. "MetLife Maps a Future with GIS," ARC News, Vol. 15, No. 1, Winter 1993, p. 25.

27. ARC News, Vol. 14, No. 4, Fall 1992, p. 14.

28. Antenucci, Brown, Croswell, Kevany with Archer, A Guide to the Technology, p. 47.

29. For further information about sophisticated transportation systems, the IPC released a paper entitled Eyes on the Road: Intelligent Transportation Systems and Your Privacy in March 1995. GIS technology plays a significant role in a number of intelligent transportation systems.

30. Roger Petzold, "Yielding the Benefits of GIS," American City and Country, March 1994, p. 63.

31. Ginger M. Juhl, "GIS Facilitates High-Tech War on Drugs," GIS WORLD, Vol. 6, No. 4, April 1993, p. 60.

32. Tim Miller, "Computers Track the Criminal's Trail," American Demographics, January 1994, pp. 13-14.

33. Neil Smith, "History and philosophy of geography: Real wars, theory wars," Progress in Human Geography, Vol. 16, No. 2 (1992), p. 258.

34. Ibid., p. 257.

35. ARC News, Vol. 15, No. 1, Winter 1993, p. 3.

36. Tracy Peverett. "All Mapped Out: The Application of GIS (geographic information system) technology has charted a clear road to riches for this reseller," Canadian Computer Reseller, Vol. 7, No. 8, April 20, 1994, p. 19.

37. J. R. Beaumont. "GIS and Market Analysis," in Geographic Information Systems - Principles and Applications, edited by David J. Maguire, Michael F. Goodchild, and David W. Rhinds (New York: John Wiley & Sons, 1991), Vol. 2, pp. 139 and 145.

38. "GIS System for Marketing Applications Introduced," ARC News, Vol. 15, No. 3, Summer 1993, p. 6.

39. ARC News, Summer 1993, Vol. 15, No. 3, p. 6.

40. Tony Buxton, "GIS Expected to Meet Micromarketing Challenge," GIS World, Vol. 5, No. 1, February 1992, p. 71.

41. "GIS System for Marketing Applications Introduced," p. 6.

42. Buxton, "Micromarketing Challenge," p. 71.

43. David Burnham, The Rise of the Computer State (New York: Random House, 1983), pp. 89, 91, 93 and 95.

44. Fraser Taylor, "Geography, GIS and the Modern Mapping Sciences/Convergence or Divergence?" Cartographic, Vol. 30, Nos. 2 & 3, Summer/Autumn 1993, p. 49.

45. GIS World, Special Issue, July 1992, pp. 14-15.

46. Valerie Higgin, "Corporate Information Philosophy Drive's Toronto GIS," MicroSoftware News, October 1991, p. 1.

47. Zorica D. Budic, "Effectiveness of Geographic Information Systems in Local Planning," APA Journal, Spring 1994, 60:2, p. 256.

48. Ed Kennedy, "The Canadian Geomatics Industry - Partners in the development of local government GIS," Municipal World, May 1991, p. 3.

49. Aronoff, A Management Perspective, pp. 16-17.

50. Elizabeth J. Ottaway, "The County of Oxford Land-Related Information System," Municipal World, September 1989, pp. 231 and 249.

51. Jack Dangermond, "Lincoln County, N.C.. Opens the Door to Public Access," American City and County, October 1994, p. 36.

52. R.T. Aangeenbrug, "A Critique of GIS," in Geographic Information Systems - Principles and Applications, Vol. 1, p. 104.

53. Michael F. Goodchild, "Geographic Information Systems and Geographic Research," in Ground Truth: The Social Implications of Geographic Information Systems, edited by John Pickles (New York: The Guilford Press, 1995), p. 48.

54. Trevor M. Harris, Daniel Weiner, Timothy A. Warner, and Richard Levin, "Pursuing Social Goals Through Participatory Geographic Information Systems," in Ground Truth, p. 218.

55. Aangeenbrug, "A Critique of GIS," p. 101.

56. Ibid., p.103.

57. David F. Sinton, Reflections on 25 Years of GIS, n.d., p. 3.

58. Howard Veregin, "Computer Innovation and Adoption of Geography," in Ground Truth, pp. 97-99.

59. Ibid., pp. 91 and 92.

60. Aangeenbrug, "A Critique of GIS," p. 105.

61. Goodchild, "Geographic Research," p. 32.

62. Veregin, "Computer Innovation," pp. 100-101.

63. Aronoff, A Management Perspective, pp. 285-286.

64. Veregin, "Computer Innovation," p. 105.

65. John Pickles, "Representations in an Electronic Age: Geography, GIS, and Democracy," in Ground Truth, pp. 16-17.

66. M.G. Stone and Malcolm Warner, "Politics, Privacy and Computers," The Political Quarterly 40(1969), p. 260, as cited in Colin J. Bennett, Regulating Privacy: Data Protection and Public Policy in Europe and the United States (Ithaca: Cornell University Press, 1992), p. 29.

67. Ibid.

68. Bennett, Regulating Privacy, p. 28.

69. Jeffery H. Reiman, "Driving to the Panopticon: A Philosophical Exploration of the Risks to Privacy Posed by the Highway Technology of the Future." Santa Clara Computer and High Technology Law Journal -- Privacy and ITS, March 1995, p. 39.

70. Alan Westin, Privacy and Freedom (New York: Atheneum, 1967), p. x, as quoted in Bennett, Regulating Privacy, p. 13.

71. Sheri A. Alpert, "Privacy and Intelligent Highways: Finding the Right of Way," Santa Clara Computer and High Technology Law Journal -- Privacy and ITS, March 1995, p. 102.

72. R. v. Dyment (1988), 55 D.L.R. (4th) 503 at 513 (S.C.C.).

73. Deborah G. Johnson, Computer Ethics (Englewood Cliffs, N.J.: Prentice-Hall, 1985), p. 66, as cited in James H. Moor, "How to Invade and Protect Privacy with Computers," The Information Web: Ethical and Social Implications of Computer Networking, edited by Carol C. Gould (San Francisco: Westview Press, Inc., 1989), pp. 60-61.

74. Commission on Freedom of Information and Individual Privacy, Public Government for Private People, Vol. 2 (Toronto: Queen's Printer of Ontario, 1980), p. 499.

75. Warren Freedman, The Right to Privacy in the Computer Age (New York: Quorum Books, 1987), p. 11.

76. Arthur R. Miller, The Assault on Privacy: Computers, Data Banks, and Dossiers (Ann Arbor: University of Michigan Press, 1971), p. 21, as cited by Bennett, Regulating Privacy, p. 29.

77. Oscar H. Gandy, Jr., "The Surveillance Society: Information Technology and Bureaucratic Social Control," Journal of Communication, Summer 1989, p. 66.

78. Bennett, Regulating Privacy, p. 19.

79. Harlan J. Onsrud, Jeff P. Johnson and Xavier Lopez, "Protecting Personal Privacy in Using Geographic Information Systems," URL: http://www.umesve.maine.edu/tempe/onsrud.html, p. 8, previously published in Photogrammetric Engineering and Remote Sensing, Vol. 60, No. 9, September 1994, pp. 1083-1095.

80. Bennett, Regulating Privacy, p. 34.

81. Onsrud, Johnson, and Lopez, "Protecting Personal Privacy in Using Geographic Information Systems," p. 1.

82. Privacy Commissioner of Canada, Annual Report 1988-89 (Ottawa: Minister of Supply and Services Canada, 1989), pp. 12-13.

83. E.F. Epstein. "Legal Aspects of GIS," in Geographic Information Systems - Principles and Applications, Vol. 1, p. 495.

84. United States Department of Justice, et al., v. Reporter's Committee for Freedom of the Press et al. (109 S. Ct. 1468 [1989]), p. 1477.

85. Tracy B. Strong, "The Practical Unity of Community and Privacy," Humanitas, Vol. XI, p. 85.

86. Norman Y. Mineta, "Transportation, Technology and Privacy," Santa Clara Computer and High Technology Law Journal -- Privacy and ITS, March 1995, p. 7.

87. Reiman, "Driving to the Panopticon," pp. 33-34.

88. H. Bishop Dansby, "Commentary: Selling Public GIS Data," GIS Law, Vol. 1, No. 4, 1993, p. 18.

89. Nancy B. Lerner, "Florida County Develops a Successful Information Access Policy," GIS World, Special Issue, July 1992, p. 40.

90. Office of the Information and Privacy Commissioner/Ontario and the Freedom of Information and Protection of Privacy Office, Public Access Services Branch, Management Board Secretariat, Enhancing Access to Information: RD/AD Success Stories, April 1996, Foreword.

91. Office of Technology Assessment, Informing the Nation: Federal Information Dissemination in the Electronic Age (Washington, D.C.: United States Government Printing Office, October 1988), pp. 8-10.

92. In Suggested Changes to the *Municipal Freedom of Information and Protection of Privacy Act*: Submission to the Standing Committee on the Legislative Assembly the IPC recommended amending the *Acts* to address this issue. The purpose of Amendment 27 (quoted below) was to provide an explicit obligation for government organizations to grant access in forms that are most meaningful and useful for requesters, unless it is not practical to do so:

27. Amend section 23 of the *Act* to provide an explicit obligation for an institution to, whenever possible, provide access in the form specified by the requester, unless it would be unreasonable to do so.

93. Information and Privacy Commissioner/Ontario and the Freedom of Information and Protection of Privacy Office, Enhancing Access to Information, Foreword.

94. Another amendment recommended by the IPC in Suggested Changes to the *Municipal Freedom of Information and Protection of Privacy Act*: Submission to the Standing Committee on the Legislative Assembly proposed a way of addressing this issues. The purpose of Amendment 50 (the relevant portion quoted below) was to place an obligation on government organizations to ensure, whenever practicable and reasonable, maximum public access to electronically maintained government information. To do that, government organizations would have to design information systems with equity of access and the broadest possible level of access in mind. The proposed amendments would also help ensure that government organizations did not allow the technology to be the sole determinant of what information is disseminated and how.

50. Introduce the following regulation regarding access to government-held information:

When records maintained electronically include items of information that would be available under the Act, an institution in designing its information retrieval methods, whenever practicable and reasonable, shall do so in a manner that permits the retrieval and severance of available items in order to foster maximum public access.

95. Kay Brown, "A Review of Alaska's Public Information Access Laws, Extended Abstract," NCGIA Initiative on Law, Information Policy, and Spatial Databases, 1994, pp. 31-32.

96. Harlan J. Onsrud, Jeffrey Johnson, and Judy Winnecki, "GIS Dissemination Policy: Two Surveys and a Suggested Approach," unpublished manuscript, National Center for Geographic Information and Analysis, University of Maine, Orono, ME, 1996, as cited in the Office of the Information and Privacy Commissioner, Province of British Columbia, Order 91-1996, March 11, 1996, p. 27.

97. Dansby, "Commentary," p. 19.

98. Management Board of Cabinet, Managing Intellectual Property, Directive 7-6, 1995, pp. 1-4.

99. Hugh R. Jones, "Geographic Information System ("GIS"): What is it, What Makes it so Special?" 17th Annual COGEL Conference, Washington, D.C., 1995, p. 3.

100. In Suggested Changes to the *Municipal Freedom of Information and Protection of Privacy Act*: Submission to the Standing Committee on the Legislative Assembly the IPC proposed an amendment to address this issue.

    49. Amend Part IV of the *Act* to prohibit institutions from giving private sector vendors exclusive distribution rights to government data if such an arrangement impairs the right of the public to access such information.

101. Lou Milrad, "Database Ownership, Canadian Copyright Principles and Multiparticipant GIS Projects," GIS Law, Vol. 2, No. 2, 1994, p. 8.

102. Office of the Information and Privacy Commissioner/Ontario Interim Order P-1281, p. 21.

103. Information Highway Advisory Council, Connection, Community, Content: The Challenge of the Information Highway (Ottawa: Minister of Supply and Services Canada, September 1995), p. 117.

104. Milrad, "Database Ownership," p. 7.

105. Ibid., p. 8.

APPENDIX A - Privacy Impact Assessment

Protection of Privacy

- Will the proposed GIS application aggregate or computerize any information, public or personal, that may alter the existing privacy interests of that information? If so, should new or special privacy safeguards be implemented?

- Are there less privacy-intrusive alternatives that can produce equivalent results? What other options have been considered, what was their impact on privacy, and why were they not selected?

Personal Information

- Will the information to be included in the proposed GIS application fall under the *Acts'* definition of personal information? If so, is it absolutely necessary to use identifiable information? Why? If not, should the information still be managed in accordance with fair information practices in order to be responsive to the public's concern about use of advanced information technology?

- Will the proposed GIS application enhance the privacy of individuals' personal information held by the government organization?

- Will the proposed GIS application make available or reveal any previously unavailable personal information? How should this newly available information be protected?

- How might the public react if the information to be included in the proposed GIS application was available on the Internet (i.e., the "Internet Challenge")? Would that estimated reaction warrant a re-thinking of the information to be included in the proposed GIS application?

Public Record

- Will the proposed GIS database be maintained for the purpose of creating a record that is available to the general public? What is the authority for creating a public record? Even if the records are public in nature, should they be managed in accordance with fair information practices because of potential public privacy concerns relating to that information?

Collection

- Could there be adverse consequences for the data subject from the collection of personal information? If so, should that information be collected or used? Can the same results be accomplished with anonymized or aggregate information?

- What is the minimum information necessary and relevant to the purposes of the proposed application? Why is that information needed? Is any additional information being collected or used? If so, why is it necessary?

- Will there be collection of any new personal information? What is the authority for the collection? Is new legislation/regulation/policy required or appropriate? What are the purposes of the collection? Will the information be collected directly from the data subject, if not, why not?

Data Subject Knowledge, Consent and Notice

- Will the data subjects know about the existence of the proposed GIS application and if not, why not? What reasons exist for not requiring data subject knowledge and consent for all aspects of the application?

- Will the data subjects be notified? If not, why not? If so, what type of notification would be appropriate?

- How will the sources of the GIS data be tracked? How will that information be communicated to the data subjects if they request identification of sources?

Retention

- How long will information be needed to be kept in order to achieve the purpose of the proposed GIS application? What provisions are in place to ensure that information is not retained for too long or disposed of too soon?

Accuracy

- What steps will be taken to ensure that the information needed for the proposed GIS application is accurate and up-to-date? What procedures are in place to verify information and to ensure that information will not be used if it is inaccurate or out-of-date?

Disposal

- How will the information to be used in the proposed GIS application be disposed of?

Security

- How will the information to be used in the proposed GIS application be secured? What procedures are in place to determine that the proposed methods of security are appropriate for the type of records and the nature of any possible risks?

- What safeguards against such risks as unauthorized access, destruction, modification, use, or disclosure are necessary and appropriate? How will these be tested and monitored?

Use

- How should the information for the proposed GIS application be used? Who should be using the information? What technological or policy restrictions should be in place to ensure that there are no unrelated or unauthorized uses or users?

Consistent Purpose

- Are there any additional purposes for which the information to be included in the proposed GIS application could be used? Are these additional uses absolutely necessary? If yes, should the additional purposes be defined as a primary, rather than as consistent purposes, and the data subjects notified of its existence at the outset?

Disclosure

- When and how should the information related to the proposed GIS application be disclosed, and to whom? Will the public have access? If so, should the answers to any of these questions be reconsidered?

- What are the official duties or legitimate functions that would need information from the proposed GIS application? Why would the information related to the proposed GIS application be necessary for the performance of that duty or function? What is the minimum amount of information necessary for that performance? Can it be performed with aggregated or anonymized information?

- Will the database of the proposed GIS application be sold? Should it be? What steps should be taken to minimize the negative impact on privacy?

Personal Information Bank

- Should the information for the proposed GIS application be included in a personal information bank?

Data Subject Right of Access and Correction

- Will the proposed GIS application provide individuals with a right of access to their information?

- Is there anything in the proposed design of the GIS application that would prevent an individual from being able to access or correct their personal information? If so, how can that access be provided?

Request for Access

- Will the design of the proposed GIS application permit access to be provided, within reason, to requesters in a comprehensible form determined by them? Will alternative formats necessitate any additional costs? How can the costs be minimized?

- Will the design of the proposed GIS application permit the severance of selective personal information from the database? If not, why not?

Computer Matching

- Will the information to be included in the proposed GIS application need to be linked or matched with information from other databases? Why? What steps should be taken to minimize the negative impact on privacy?

Testing and Evaluation

- Will there be an opportunity to test the proposed GIS application in order to evaluate the effectiveness of privacy protective measures and to identify and address any problem?

Accountability

- Who will be held accountable for maintaining the proposed GIS application and for complying with the *Acts*?